



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,394	12/28/2001	Jum Soo Kim	054216-5016	2075
43569 7590 06/07/2007 MAYER, BROWN, ROWE & MAW LLP 1909 K STREET, N.W. WASHINGTON, DC 20006			EXAMINER NGUYEN, KHIEM D	
			ART UNIT 2823	PAPER NUMBER
			MAIL DATE 06/07/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/029,394

Applicant(s)

KIM ET AL.

Examiner

Khiem D. Nguyen

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 7-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION*****Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

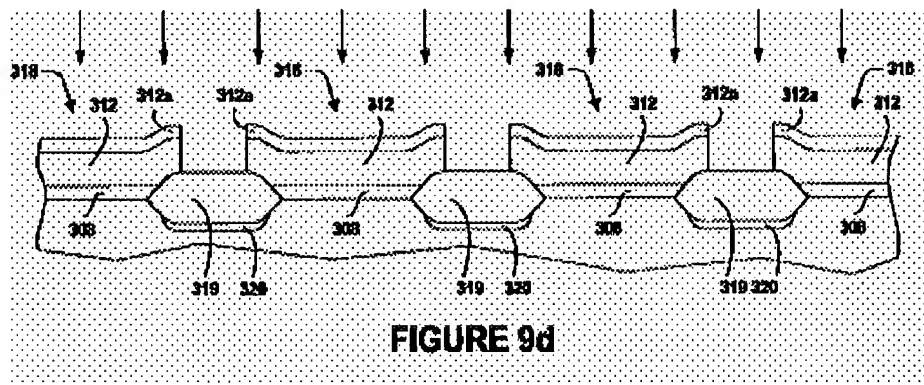
A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 7-10 and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by Fang (U.S. Patent 6,667,511).

In re claim 7, **Fang** discloses a method of manufacturing a code address memory cell in a peripheral circuit region and a flash memory cell in a cell region, the method comprising:

forming a device isolation structure 319 in a semiconductor substrate 304 (col. 9, lines 16-31 and FIG. 9d);



forming a tunnel oxide layer 308 and a floating gate layer 312 over the cell region 346 of the semiconductor substrate 304 in the peripheral region 342/348 of the semiconductor substrate 304 (col. 9, lines 43-56 and FIGS. 7a-b and 9i);

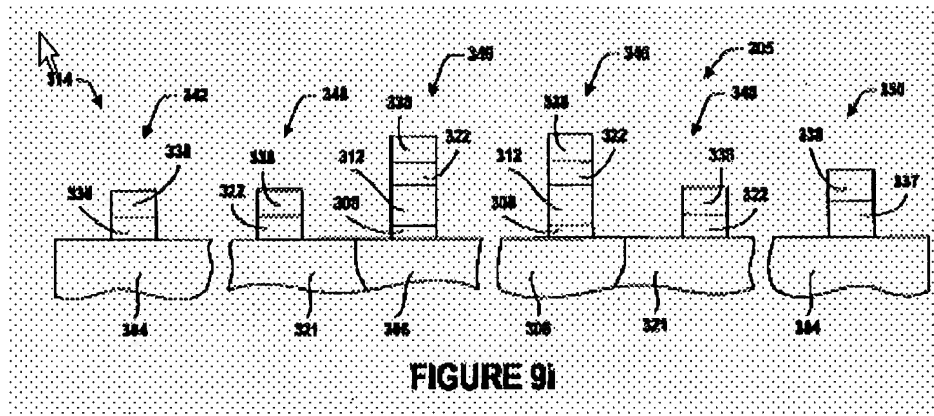


FIGURE 9i

forming a dielectric layer 322 and a control gate (poly 2) 338 over the floating gate layer (poly1) 312 in the cell region 346 and over the semiconductor substrate 304 in the peripheral circuit region 342/348 (col. 10, lines 6-65), the dielectric layer 322 including an oxide layer and a nitride layer (ONO) (col. 10, lines 29-38); and

forming a source S and a drain D region in the semiconductor substrate 304 by performing an impurity ion implantation process (FIGS. 7a-b).

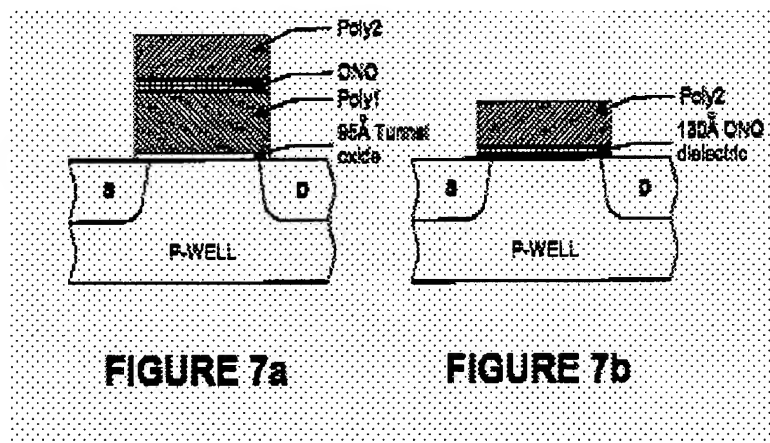


FIGURE 7a

FIGURE 7b

In re claim 8, as applied to claim 7 above, **Fang** discloses all claimed limitations including the limitation wherein the dielectric layer 322 is formed by stacking at least two or more layers of at least one of the oxide layer and the nitride layer (oxide-nitride-oxide, ONO layer) (col. 10, lines 29-38).

In re claim 9, as applied to claim 7 above, **Fang** discloses all claimed limitations including the limitation wherein the dielectric layer 322 is formed in thickness of about 130 Angstroms (col. 10, lines 35-36).

In re claim 10, as applied to claim 7 above, **Fang** discloses all claimed limitations including the limitation wherein the dielectric layer 322 is formed by stacking a first oxide layer O, a nitride layer N and a second oxide layer O (ONO) (col. 10, lines 29-38).

In re claim 14, as applied to claim 7 above, **Fang** discloses all claimed limitations including the limitation wherein the floating gate layer 312 and the control gate layer 388 is formed of polysilicon (col. 10, line 63).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

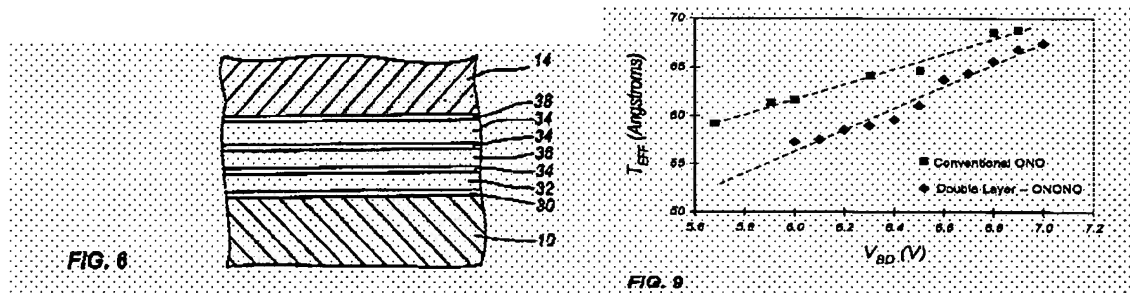
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fang (U.S. Patent 6,667,511) in view of Sheng et al. (U.S. Patent 5,981,404).

In re claim 11, as applied to claim 7 Paragraph 3 above, **Fang** discloses all the claimed limitations including a method of manufacturing a code address memory cell in a

peripheral circuit region and a flash memory cell in a cell region, the method comprising forming a dielectric layer 322 and a control gate (poly 2) 338 over the floating gate layer (poly1) 312 in the cell region 346 and over the semiconductor substrate 304 in the peripheral circuit region, the dielectric layer 322 including an oxide layer and a nitride layer (oxide-nitride-oxide, ONO) (col. 10, lines 29-38 and FIG. 9i) but does not explicitly disclose that the dielectric layer is formed by stacking a first oxide layer O, a first nitride layer N, a second oxide layer O, and a second nitride layer N (ONON).

**Sheng**, however, discloses a insulating structures used in DRAMs or other memory devices such that the dielectric layer is formed by stacking a first oxide layer 30, a first nitride layer 32, a second oxide layer 34, and a second nitride layer 36 (ONON) between the lower doped polysilicon electrode 10 and the upper doped polysilicon electrode 14 (col. 7, lines 41-65 and FIGS. 6 and 9).



As Sheng et al. disclose, one of ordinary skill in the art would have been motivated to provide a dielectric layer formed by stacking a first oxide layer, a first nitride layer, a second oxide layer, and a second nitride layer (ONON) in order to significantly reduced number of defect structures that extend directly through most or all of the dielectric layer (see col. 4, lines 58-61, Sheng).

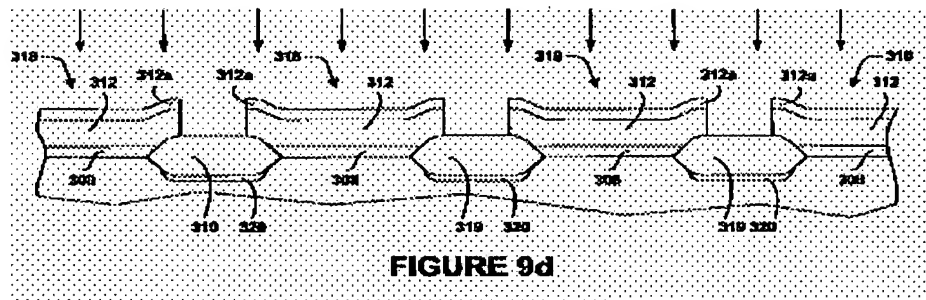
Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant(s) claimed invention was made to modify Fang reference with a dielectric layer formed by stacking a first oxide layer, a first nitride layer, a second oxide layer, and a second nitride layer (ONON) as taught by Sheng in order to significantly reduced number of defect structures that extend directly through most or all of the dielectric layer (see col. 4, lines 58-61, Sheng).

In re claim 12, as applied to claim 7 above, Fang in view of Sheng discloses all claimed limitations including the limitation wherein the dielectric layer is formed by stacking a first oxide layer 30, a first nitride layer 32, a second oxide layer 34, a second nitride layer 36, and a third oxide layer 34 (ONONO) (col. 7, lines 41-65 and FIGS. 6 and 9, Sheng).

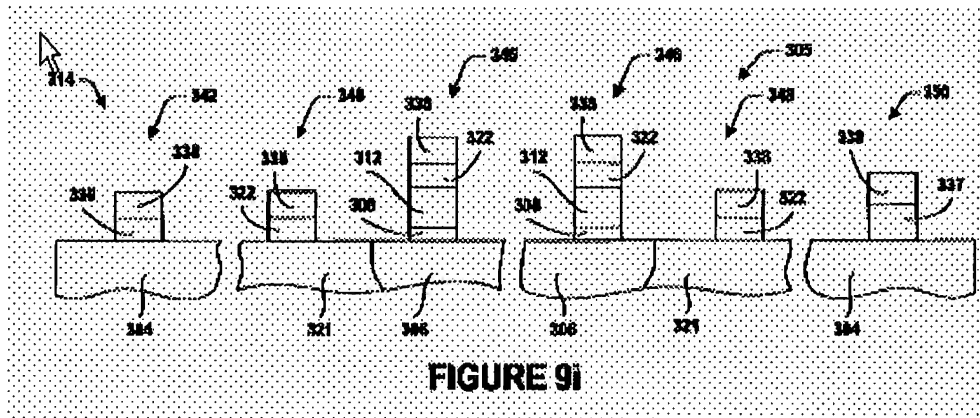
5. Claims 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fang (U.S. Patent 6,667,511) in view of Sheng et al. (U.S. Patent 5,981,404).

In re claim 13, **Fang** discloses a method of manufacturing a code address memory cell in a peripheral circuit region and a flash memory cell in a cell region, the method comprising:

forming a device isolation structure 319 in a semiconductor substrate 304 (col. 9, lines 16-31 and FIG. 9d);

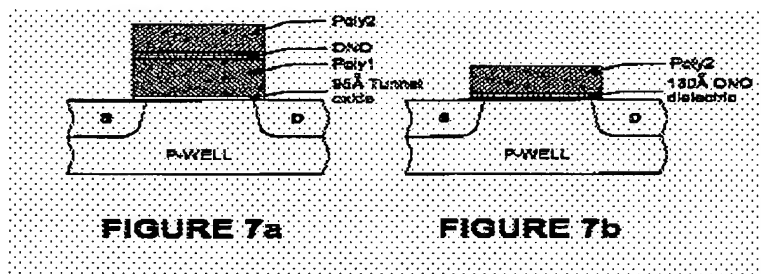


forming a tunnel oxide layer 308 and a floating gate layer 312 over the cell 346 in the peripheral region 342/348 of the semiconductor substrate 304 (col. 9, lines 43-56 and FIGS. 7a-b and 9i);



forming a dielectric layer 322 and a control gate (poly 2) 338 over the floating gate layer (poly1) 312 in the cell region 346 and over the semiconductor substrate 304 in the peripheral region 342/348 (col. 10, lines 6-65), the dielectric layer 322 including an oxide layer and a nitride layer (ONO) (col. 10, lines 29-38); and

forming a source S and a drain D region in the semiconductor substrate 304 by performing an impurity ion implantation process (FIGS. 7a-b).



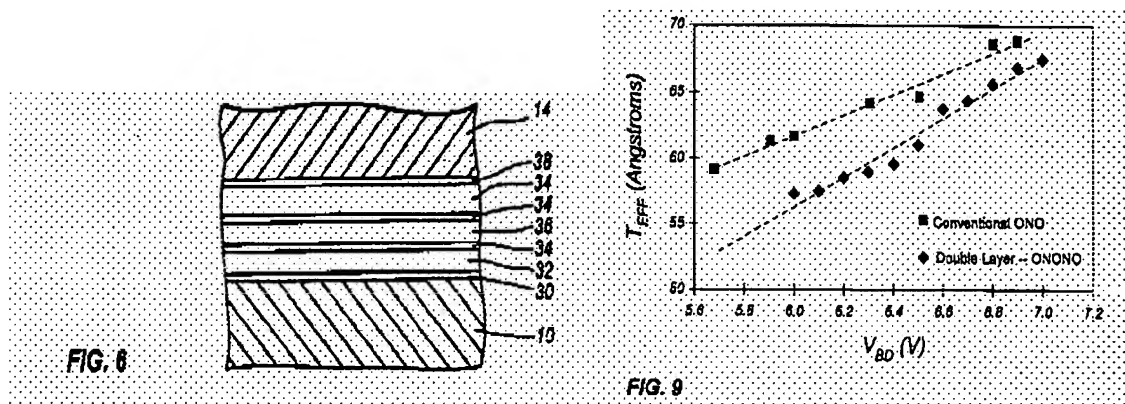
**Fang** discloses forming a dielectric layer 322 and a control gate (poly 2) 338 over the floating gate layer (poly1) 312 in the cell region 346 and over the semiconductor substrate 304 in the peripheral region 342/348, the dielectric layer 322 including an oxide



Art Unit: 2823

layer and a nitride layer (oxide-nitride-oxide, ONO) (col. 10, lines 29-38 and FIG. 9i) but does not explicitly disclose that the dielectric layer including a first oxide layer O, a first nitride layer N, a second oxide layer O, and a second nitride layer N and a third oxide layer O (ONONO).

**Sheng**, however, discloses a insulating structures used in DRAMs or other memory devices such that the dielectric layer is formed by stacking a first oxide layer 30, a first nitride layer 32, a second oxide layer 34, a second nitride layer 36, and a third oxide layer (ONONO) between the lower doped polysilicon electrode 10 and the upper doped polysilicon electrode 14 (col. 7, lines 41-65 and FIGS. 6 and 9).



As Sheng et al. disclose, one of ordinary skill in the art would have been motivated to provide a dielectric layer formed by stacking a first oxide layer, a first nitride layer, a second oxide layer, a second nitride layer, and a third oxide layer (ONONO) in order to significantly reduced number of defect structures that extend directly through most or all of the dielectric layer (see col. 4, lines 58-61, Sheng).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant(s) claimed invention was made to modify Fang reference with a

dielectric layer formed by stacking a first oxide layer, a first nitride layer, a second oxide layer, a second nitride layer, and a third oxide layer (ONONO) as taught by Sheng in order to significantly reduced number of defect structures that extend directly through most or all of the dielectric layer (see col. 4, lines 58-61, Sheng).

In re claim 15, as applied to claim 13 above, **Fang** discloses all claimed limitations including the limitation wherein the floating gate layer 122a and the control gate layer 144 is formed of polysilicon (col. 7, lines 31-60).

***Response to Applicants' Amendment and Argument***

6. Applicants' arguments filed March 22<sup>nd</sup>, 2007 have been fully considered but they are not persuasive.

Applicants contend that the reference Fang (U.S. Patent 6,667,511), herein known as Fang, does not teach or disclose an ONO dielectric being formed over a peripheral circuit region.

In response to Applicants' contention that Fang does not teach or suggest forming a dielectric layer in the cell region and over the semiconductor substrate in the peripheral circuit region, the dielectric layer including an oxide layer and a nitride layer, Examiner respectfully disagrees.

Applicants' attention is respectfully directed to (col. 10, lines 29-38 and FIGS. 7a-b and 9i) where Fang discloses forming a dielectric layer 322 and a control gate (poly 2) 338 over the floating gate layer (poly1) 312 in the cell region 346 and over the semiconductor substrate 304 in the peripheral circuit region 342/348 (col. 10, lines 6-65),

the dielectric layer 322 including an oxide layer and a nitride layer (ONO) (col. 10, lines 29-38).

For this reason, examiner holds the rejection proper.

### ***Conclusion***

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

### ***Correspondence***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D. Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:30 AM - 5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2823

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

K.N.

June 01, 2007

*Brook Kebede*  
BROOK KEBEDE  
PRIMARY EXAMINER